**CHALLENGE PROBLEMS**

1. **Equation** Write an equation in the form \( y = ax^2 + bc + c \) for the quadratic function whose graph passes through \((8, 0), (0, 8)\) and \((-2, 0)\).

2. **Roots** Find the roots of \( x^2 + \left(\frac{k^2 + 1}{k}\right)x + 1 = 0 \).

3. **Evaluating** If \( \left(\frac{2}{x} - x\right)^2 = 0 \), evaluate \( x^6 \).

4. **Real roots** Find all values of \( k \) that ensure that the roots are real for \( x - k(x - 1)(x - 2) = 0 \).

5. **Factors** Find all possible values of \( k \) so that \( 3x^2 + kx + 5 \) can be factored as the product of two binomial factors with integer coefficients.

6. **Positive integers** Show that there are nine pairs of positive integers \((m, n)\) such that \( m^2 + 3mn + 2n^2 - 10m - 20n = 0 \).

7. **Measurement** The difference in the length of the hypotenuse of \( \triangle ABC \) and the length of the hypotenuse of \( \triangle XYZ \) is 3. Hypotenuse \( AB = x \), hypotenuse \( XY = \sqrt{x - 1} \) and \( AB > XY \). Determine the length of each hypotenuse.